THE EFFICACY OF FRACTIONED RADIATION PROCEDURES ON CULTURES OF HUMAN CELLS

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Abstract. Protecting the lives and health of people is a constant concern of both the medical staff and of specialists from different fields (biochemistry, biophysics, biology, etc.). Their joined efforts lead to the development of new means of treatment based on the discoveries of new technology, among which lies phototherapy. Also the benefic effects of light radiation has been well known for some time, its use still remains a problem, open to a medical approach for both fundamental and applied research.
The main concern of the studies done on laser radiation of low power and its effect on a cellular level has been to set the values of the radiation parameters (wave length, energy density, time of exposure) in a single radiation procedure.
The results obtained with such a procedure vary according to type of cell and the laser parameters that are used.

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The results obtained with such a procedure vary according to type of cell and the laser parameters that are used.

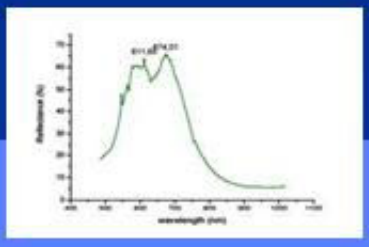
Objective: The object of this paper is to present the effects of a fractioned radiation procedure rather than a single radiation one, on human cells.

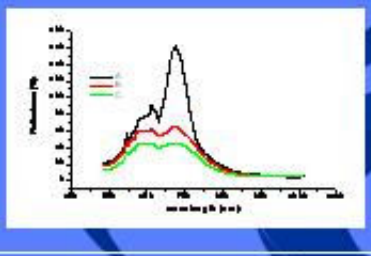
Materials and method: To test the radiation procedures, we used groups of human cells extracted from the umbilical vane: one test group and three radiated groups: one with single radiation procedure, one with fractioned double radiation procedure and one with fractioned triple radiation procedure. For the evaluation of the biologic response to the radiation, the optic parameters of the cell culture were determined through dispersed reflection spectrometry.

Diffuse reflectance spectroscopy - Experimental set-up

Laser irradiation

Results: The total diffuse reflection spectra representative of the cellular cultures present two maxima of reflection localised at wavelength λ_1 = 611,65 nm and λ_2 = 674,01 nm,, and a minimum of diffuse reflection at λ_3 = 630,74 nm (fig3). .Under exposure to the laser radiation, the maxima/minimum of diffuse reflection decreases after each session of irradiation indicating a rise of absorption of laser radiation due to of the proliferations of cells (fig4). The variation of total diffuse reflectance (at λ = 635 nm), after application of the three procedures of irradiation had been ARSI = 30,235 %, ARSD = 51,478 % and ARST = 44,991%. So the most efficient was double fractionated irradiation procedure.





Conclusions: The variation of the optical constants K(λ), n(ω) and k(ω) of the cell cultures exposed to the treatment had proven that the application of fractionated laser irradiation procedure is more efficient than the simple irradiation procedure in vitro low level laser therapy.

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